PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project	
Hungry Horse Mitigation - Watershed Restoration & Monitoring (MFWP Umbrella Subproposal)	
BPA project number	**9101903**
Contract renewal date (mm/yyyy)	**07/1999**
Multiple actions? (indicate Yes or No)	**Yes**
Business name of agency, institution or organization requesting funding	
Montana Fish, Wildlife & Parks	
Business acronym (if appropriate)	**MFWP**
Proposal contact person or principal investigator:	
Name	**Brian Marotz, Ladd Knotek**
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NPPC Program Measure Number(s) which this project addresses	
10.1B, 10.1C, 10.3A.1-4, 10.3A.6-8, 10.3A.10-13, 10.3A.17	
FWS/NMFS Biological Opinion Number(s) which this project addresses	
Bull Trout ESA Listing (63 FR 31647) **Westslope Cutthroat Trout - Petitioned for ESA Listing (63 FR 31691)** **NMFS hydrosystem operations for salmon and steelhead recovery (56 FR 58619; 57 FR 14653; 62 FR 43937)**	
Other planning document references	
Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam (MFWP & CSKT 1991), Hungry Horse Dam Fisheries Mitigation Implementation Plan (MFWP &CSKT 1993), Fish Passage and Habitat Improvement in the Upper Flathead River Basin (Knotek et al. 1997). Montana Bull Trout Restoration Plan (Montana Bull Trout Restoration Team 1997), Montana Westslope Cutthroat Trout Restoration Plan (Montana Westslope Cutthroat Restoration Team, In preparation), Monitoring Master Plan for the Flathead Basin (Flathead Basin Commission 1985), Forest Plan: Flathead National Forest (Brannon 1985), Water Quality Data and Analyses to Aid in the Development of Revised Water Quality Targets for Flathead Lake, Montana (Stanford et al. 1997). Flathead Basin Commission Biennial Report 1995-96 (Flathead Basin Commission 1997), Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group 1995a), South Fork Flathead River Drainage Bull	

Trout Status Report (Montana Bull Trout Scientific Group 1995b), Fish and Habitat Monitoring in the Upper Flathead Basin (Weaver et al., In prep)
Short description **Enhance and protect native fish communities in the Flathead Basin through watershed assessments, fish passage improvements, habitat enhancement, off-site fishery restoration, applied research, and project- and watershed level monitoring.**
Target species **Bull Trout, Westslope Cutthroat Trout, Mountain Whitefish, Native Fish Communities**

Section 2. Sorting and evaluation

Subbasin Upper Columbia: Flathead

Evaluation Process Sort

CBFWA caucus		CBFWA eval. process		ISRP project type	
X one or more caucus		If your project fits either of these processes, X one or both		X one or more categories	
	Anadromous fish	x	Multi-year (milestone-based evaluation)		Watershed councils/model watersheds
x	Resident Fish	x	Watershed project eval.		Information dissemination
	Wildlife				Operation & maintenance
					New construction
				x	Research & monitoring
				x	Implementation & mgmt
					Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20554	Hungry Horse Dam Fisheries Mitigation
9101903	Hungry Horse Mitigation - Watershed Restoration & Monitoring (MFWP)
9401002	Flathead River Native Species Project (MFWP)
9502500	Flathead River Instream Flow (IFIM) Project (MFWP)
9101904	Hungry Horse Mitigation - Non-native Fish Removal and Hatchery Production (USFWS)

9101901	Hungry Horse Mitigation - Flathead Lake Monitoring & Habitat Enhancement (CSKT)

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9608701	Focus Watershed Coordination - Flathead Basin (CSKT)	Serves as liaison between agencies on watershed projects. Primarily cooperator in Dayton Creek restoration
3874700	Streamnet Geographic Information Services Unit (MFWP)	Provide GIS and GPS support. Design and archive watershed maps. Manage Montana portion of STREAMNET
Wildlife Trust Fund	Hungry Horse Dam Wildlife Mitigation Program (MFWP)	Co-sponsor of Dayton Creek restoration project and other possible conservation easements
New Project	Create Stream Reference Condition Data Set for the Upper Flathead River Basin (USFS)	Quantifies reference conditions in wilderness portions of drainage to aid in restoration work of project 9101903

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1991-92	Completed study examining enhancement of benthic insect production in Hungry Horse Reservoir through slash pile installation.	Yes - Concluded that insect production can be enhanced through installation of slash piles. Not implemented full scale because cost effectiveness questionable
1992-93	Completed brook trout eradication and habitat enhancement project at Elliott Creek, a direct Flathead River tributary.	Partially - Brook trout eradication was not complete, but cutthroat trout were established; spawned and reared in improved habitat.
1991-95	Completed thermal modeling and installation of selective withdrawal structures on Hungry Horse Dam to restore normative river temperatures (Marotz et al. 1994).	Yes -Thermal targets being met (1996-98). Response of benthic invertebrates and fluvial fish being evaluated in Flathead River (see objective 6).
1992	Completed chemical rehabilitation of Lion Lake. Removed illegally introduced perch & pumpkinseed (potential contaminants) from lake ~ 2 mi from H.H. Reservoir.	Yes-exceeded. Restored trout fishery and increased angler use nearly 10-fold. Had highest angler pressure per acre among ~ 500 lakes in NW MT.
1992-96	Completed development of Integrated Rule Curves (IRCs) for Hungry Horse Reservoir (Marotz et al. 1996).	Partially - IRCs adopted by NPPC, White Sturgeon Recovery Team, etc., but have not been implemented.
1993	Completed offsite chemical rehabilitation of Rogers Lake. Removed perch and	Yes - Cutthroat and grayling populations thriving. Grayling

	reestablished cutthroat trout and arctic grayling. Lake now genetic reserve for Red Rocks Lake strain arctic grayling.	reproducing naturally in inlet. Angler use increased from 272 (1991) to 4,059 (1997) angler-days.
1994	Devine Lake Chemical Rehabilitation	Yes - Eliminated introduced brook trout population from watershed containing bull trout.
1994	Completed bank stabilization and sediment abatement project at Big Creek. Major bull trout spawning reach lies downstream.	Yes - Large bank slump has been revegetated and stabilized, reducing sediment inputs to bull trout spawning areas downstream.
1994-97	Completed cooperative culvert improvement projects on 7 Hungry Horse Reservoir tributaries to eliminate passage barriers for adfluvial cutthroat trout	Yes-exceeded. Opened ~ 18 km of high quality habitat. Adfluvial cutthroat redds found upstream of former barriers on all streams. Bull trout juveniles above past barriers on 6 of 7.
1995-96	Completed willow survival experiments in drawdown zone of H.H. Reservoir. Examined methods for re-establishing vegetation on reservoir margins.	Yes - Identified survival rates for different willow species and duration of inundation in drawdown zone.
1995	Completed sediment source surveys on road systems associated with the 6 major (direct) bull trout spawning tributaries for Hungry Horse Reservoir.	Yes - We conducted these surveys to facilitate repairs by USFS, which are underway.
1995-96	Completed fish passage and habitat enhancement project at Hay Creek (North Fork Flathead River tributary).	Partially - Summer/fall dewatering and fish stranding eliminated in 1996-98, but no evidence of bull trout re-colonization yet.
1996	Completed fish ladder at Taylor's Outflow to allow access for cutthroat trout from Flathead System to spawning tributary.	Yes - Westslope cutthroat trout used ladder in 1997-98 and gained access to restored spawning & rearing habitat.
1996	Completed offsite chemical rehabilitation of Bootjack Lake.	Yes - Pumpkinseed sunfish removed and trout fishery recovering.
1996-98	Completed channel reconstruction of ~2 km of Taylor's Outflow spring creek	Initially yes - Habitat complexity and channel stability improved substantially. Response of fish to be determined in long term.
1997	Completed food habits study for lake trout in Flathead Lake	Yes - Quantified diet composition of primary predator in Flathead System; believed to be a major limiting factor for native trout
1997	Completed offsite chemical rehabilitation of Murray and Dollar Lakes.	Initial indications, Yes - Removed illegally introduced fathead minnows & redside shiners and reestablished trout.
1998	Completed Griffin Creek fencing project. Excluded cattle from ~8 km of stream with	To be determined - Fence excluded cattle. Benefits will be long term

	genetically pure cutthroat population.	through natural riparian recovery.
1998	Completed offsite chemical rehabilitation of Little McGregor Lake.	Initial indication, Yes - Removed illegally introduced perch. Trout will be reestablished in spring 1999.
1998	Completed study quantifying zooplankton entrainment at Hungry Horse Dam under different operational scenarios using selective withdrawal (Cavigli et al. 1998).	Yes - Developed operational recommendations to minimize entrainment at dam and submitted to Bureau of Reclamation.
1997-98	Completed construction on Crossover Wetlands Project	To be determined - Installed underground diversion structure to expand wetland in reservoir drawdown zone. Biological monitoring underway.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Implement fish passage improvement projects in Flathead Drainage	a	Remove culvert barrier and road prism on USFS Rd 1638 to allow fish passage in upper Paola Creek
		b	Install baffles in Hwy 2 culvert to allow fish passage in lower Paola Creek
2	Implement habitat restoration projects in Flathead Drainage	a	Reconstruct selected channel reaches in 1.8 km section of Emery Creek concurrent with road obliteration
		b	Plan and complete lake rehabilitation of Skyles and Spencer Lakes or other lakes with illegal, non-native fish introductions
		c	Pursue livestock management agreements and eliminate point sediment/nutrient sources in Dayton Creek drainage in cooperation with CSKT
		d	Place large woody debris (LWD) in deficient (clear cut) upper reaches of Big Creek and Coal Creek drainages where wood recruitment is limited
		e	Construct channel and pond complex for Sekokini Springs Experimental Rearing Facility
		f	Complete riparian fencing in lower Hay Creek to exclude cattle in conjunction with (USFS) grazing allotment modification

Obj 1,2,3	Objective	Task a,b,c	Task
3	Conduct project-specific monitoring and evaluation of ongoing and completed projects	a	Monitor flow regimes, fish community composition, riparian recovery, and instream habitat at Hay Creek (completed habitat and passage project)
		b	Monitor water retention and response of vegetation and invertebrates at Crossover Wetland site (completed habitat project)
		c	Monitor use of fish ladder, fish response to channel restoration, and riparian recovery at Taylor's Outflow (completed watershed restoration and passage project)
		d	Monitor colonization rates of adult adfluvial cutthroat trout in 7 Hungry Horse Reservoir tributaries where passage was restored (completed passage projects)
		e	Monitor channel morphology, riparian recovery, bank stability, and fish abundance in response to cattle exclusion at Griffin Creek
		f	Monitor fish growth, species composition, and angler use at past lake rehabs on Lion, Rogers, Bootjack,, Murray, Dollar and Little McGregor Lakes
4	Complete watershed assessments, site evaluations, and public scoping to identify and prioritize new projects	a	Complete site evaluation, feasibility analysis, and landowner/public scoping for Rose Creek stream project
		b	Complete watershed assessments for upper tributaries of Big and Coal Creeks to identify riparian areas that have experienced extensive clear cutting
		c	Evaluate and scope future candidates for lake rehabilitation
5	Monitor watershed level fish and habitat parameters in cooperation with fish management staff and	a	Monitor annual McNeil streambed coring and substrate scoring sites in 21 tributaries to assess trout spawning and

Obj 1,2,3	Objective other BPA projects/agencies	Task a,b,c	Task rearing habitat quality
		b	Conduct annual adfluvial cutthroat and bull trout redd counts in 31 index tributary reaches to monitor adult runs
		c	Conduct annual cutthroat and bull trout juvenile estimates in 28 tributaries to monitor recruitment
		d	Conduct river population estimates in main stem and forks of Flathead R. to assess fish abundance, species composition, and size structure
		e	Conduct annual gill net series on Flathead Lake and Hungry Horse Reservoir to monitor basin-wide response to mitigation activities
6	Monitor effects of selective withdrawal at Hungry Horse Dam on Flathead River ecosystem	a	Monitor river temperatures at 6 locations in Flathead River system
		b	Quantify differences in macrozoobenthos diversity and abundance; pre- and post-selective withdrawal
		c	Quantify and compare fluvial trout and whitefish growth rates; pre- and post-selective withdrawal
7	Complete assessment of major biological threats to native fish stocks	a	Oversee graduate project in cooperation with the University of Montana examining interactions between rainbow trout and westslope cutthroat trout
		b	Collect samples for whirling disease and genetics testing on selected Flathead River tributaries
8	Coordinate species recovery planning and operational mitigation activities with other actions in the Columbia River Drainage (i.e. flood control, power, and species recovery actions)	a	Track activities of bull trout and cutthroat trout restoration teams, scientific groups, and status under the Endangered Species Act; provide data, maps, text, etc. for Flathead Basin populations
		b	Refine and update Integrated Rule Curves for Hungry Horse Reservoir; modify, run and link reservoir and river models

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measurable biological objective(s)	Milestone	FY2000 Cost %
1	05/1998	10/2000	Fish passage above barriers	X - individual tasks considered milestones	15%
2	06/1997	11/2002	Generally increased fish density and spawning success- varies with task	X - individual tasks considered milestones	30%
3	05/1992	N/A-Ongoing	Quantify biological/abiotic response to habitat projects - varies w/ task		10%
4	6/1992	11/2000	N/A		5%
5	10/1988	N/A-Ongoing	Quantify watershed level habitat/fish population status		15%
6	05/1995	05/2001	Quantify fish and invertebrate response to selective withdrawal		10%
7	04/1997	11/2001	Identify native stocks at risk to introgression and whirling disease		10%
8	06/1993	N/A-Ongoing	N/A		5%
				Total	100%

Schedule constraints

Schedule changes are the norm, not the exception in implementing habitat and fish passage projects. Factors such as weather, public scoping, contracting, and permitting make this an adaptive process. Some projects proceed more quickly than expected, others more slowly. We must, therefore, move on many projects simultaneously to assure that some are completed each year. Monitoring, watershed assessment, and research portions of this program are expected to proceed as scheduled.

Completion date

This is an ongoing mitigation program with NPPC approved, peer-reviewed (including Independent Scientific Group) planning documents, approved fish and habitat losses, and a proven, systematic implementation process. The program was intended to be perpetual (>40 yrs). Although ongoing and proposed projects in objectives could be completed by 2002, we are constantly conducting assessments and monitoring which allow evaluation and planning of new projects within the overall program.

Section 5. Budget

FY99 project budget (BPA obligated):	$ 474,255

FY2000 budget by line item

Item	Note	% of total	FY2000 ($)
Personnel	7.76 FTE	40.4%	$201,000
Fringe benefits	State of MT benefits package	12.2%	$61,000
Supplies, materials, non-expendable property	Office supplies, field supplies, nets, rotenone	10.2%	$50,900
Operations & maintenance	Vehicles, boat & equipment maintenance, project maintenance	5.0%	$24,900
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		0%	$0
NEPA costs	Included in personnel and supplies	0%	$0
Construction-related support	Heavy equipment, trucks, helicopter, etc. for habitat work	8.8%	$44,000
PIT tags	# of tags:	0%	$0
Travel	Lodging, per diem, commercial airfare, etc.	2.4%	$12,000
Indirect costs	17.1% overhead	14.6%	$72,726
Subcontractor	U of MT, Dr. Chris Frissell - Graduate project stipend and waiver (cost-share with project 9401002)	2.3%	$11,500
	U of MT - Wild Trout and Salmon Genetics Lab. Genetic testing for introgression.	2.0%	$10,000
	Modeling Consultant - Analyze/ update reservoir and river models	2.0%	$10,000
Other		0%	$0
	TOTAL BPA REQUESTED BUDGET *		$498,026

* Includes $10,000 for Hungry Horse Modeling Technical Analysis Project (8346500), which was assimilated into this project (9101903).

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
National Fish & Wildlife Foundation	Cost Share - Emery Creek Restoration	2.0 %	$15,000

Trout Unlimited	Cost share - Emery Creek Restoration	1.3 %	$10,000
U.S. Forest Service	Cost share- Emery Creek Restoration	6.6 %	$50,000
National Fish & Wildlife Foundation	Cost share - Paola Creek fish passage and habitat restoration*	3.9 %	$30,000
U.S. Forest Service	Cost share - Paola Creek fish passage and habitat restoration	1.6 %	$12,000
U.S. Forest Service	Cost share - LWD additions in Big and Coal Creeks	0.7 %	$5,000
U.S. Bureau of Reclam.	Dayton Creek - Develop Water Conservation Plan	2.6 %	$20,000
Hungry Horse Wildlife Mitigation Program	Cost Share - Hay Creek fencing project	0.7 %	$5,000
U.S. Forest Service	Cost Share - Hay Creek fencing project	2.0 %	$15,000
U.S. Bureau of Reclam.	Sekokini Springs - Design & Engineering Support*	3.9 %	$30,000
U.S. Forest Service	Provide funding to support watershed level monitoring	2.6 %	$20,000
Montana Dept. Of Natural Resources and Conservation	Provide funding to support watershed level monitoring	2.6 %	$20,000
MFWP - Management Staff	Cooperator in watershed level monitoring	1.3 %	$10,000
Confederated Salish and Kootenai Tribes	Dayton Creek	1.3 %	$10,000
Confederated Salish and Kootenai Tribes	Cooperator in watershed level monitoring	0.7 %	$5,000
Montana Fish, Wildlife & Parks	Cost share - whirling disease and genetics testing	1.3 %	$10,000
		Total project cost (including BPA portion)	$765,026

* Funding approval pending

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	510,000*	530,000*	530,000*	540,000*

* Each year includes $10-15,000 for Hungry Horse Modeling Technical Analysis Project (8346500), which was assimilated into this project (9101903).

Section 6. References

Watershed?	Reference
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PART II - NARRATIVE

Section 7. Abstract

In 1993, the Council adopted the Hungry Horse Dam Fisheries Mitigation Implementation Plan.

This plan contains approved losses for bull trout, westslope cutthroat trout and stream habitat and describes specific measures to protect and enhance resident fish and aquatic habitat. Knotek et al. (1997) updated and formalized a plan that guides our watershed restoration efforts in the Flathead Basin, primarily through implementation of habitat and fish passage improvement projects. Current fish passage projects reconnect access to blocked spawning and rearing habitat. Habitat projects in spring creek, stream, lake, and reservoir environments emphasize passive restoration with conventional, biotechnical, and experimental approaches. Projects address riparian degradation, major sediment and nutrient sources, channel and bank instability, and non-native fish introductions.

A specific monitoring strategy, including pre- and post-treatment sampling, is designed for each restoration project. These are combined with watershed level spawning substrate, redd count, electrofishing, and gill net monitoring series to assess direct and indirect effects of the program. Installation of selective withdrawal at Hungry Horse Dam has successfully restored normative temperatures to the Flathead River. We are assessing the effect of this change on invertebrate and fish communities downstream. Offsite projects, particularly lake rehabilitations, have been successful in creating genetic reserves for native fish, drastically improving fisheries, and eliminating 'source' populations for further illegal introductions. Completed and ongoing projects were identified primarily through past watershed assessments and applied research addressing major threats to native stocks. These remain active components of the program to help ensure quality projects in the future.

Section 8. Project description

a. Technical and/or scientific background

See Umbrella Proposal for Hungry Horse Fisheries Mitigation (MFWP).

b. Rationale and significance to Regional Programs

See Umbrella Proposal for Hungry Horse Fisheries Mitigation (MFWP).

c. Relationships to other projects

See Umbrella Proposal for Hungry Horse Fisheries Mitigation (MFWP).

d. Project history (for ongoing projects)

This is an ongoing mitigation program: BPA Project 9101903 entitled Hungry Horse Mitigation - Habitat Restoration and Monitoring. It has been underway since 1993 (6 yr). Past annual costs were $274,300, $296,579, $0, $377,925, $368,992 and $469,691 for FY 1993-98, respectively (total costs 1993-98 were $1,787,487).

Major project reports include the Hungry Horse Dam fisheries mitigation 1992-93 biennial report (Hungry Horse Implementation Group 1994), 1993-94, 1995, and 1996 kokanee stocking and monitoring reports (Deleray et al. 1995, Hansen et al. 1996, Carty et al. 1997), Hungry Horse

Mitigation: aquatic modeling of the selective withdrawal system at Hungry Horse Dam, Montana (Marotz et al. 1994), Model development to establish integrated operational rule curves for Hungry Horse and Libby Reservoirs, Montana, (Marotz et al. 1996), Fish passage and habitat improvement in the upper Flathead Basin (Knotek et al.1997), Minimizing zooplankton entrainment at Hungry Horse Dam: implications for operation of selective withdrawal (Cavigli et al. 1998), and Fish and habitat monitoring in the upper Flathead Basin (Weaver et al., In prep.).

Previous results include completion of numerous fish passage and habitat projects, an establishment of an extensive monitoring program, installation and operation of selective withdrawal at Hungry Horse Dam (HHD), development of integrated rule curves for HHD, and offsite lake rehabilitations. From 1992-1995, monitoring of the kokanee program expended a great amount of field effort and resources. In 1995-97, CSKT assumed a large portion of the kokanee monitoring program, freeing more time for us to pursue habitat restoration projects. Highlights include work on Hay Creek, where >18 km of bull trout (BT) spawning/rearing habitat was reconnected to North Fork Flathead River by redefining the channel in a braided reach that was subject to seasonal dewatering. Hay Creek flows reached the North Fork during the fall BT spawning period in 1995-98. Seven fish passage projects in tributaries to Hungry Horse Reservoir (HHR), proposed since 1954, were complete in 1997. In total, these projects expand available adfluvial westslope cutthroat trout (WCT) spawning and rearing habitat in HHR by 16 percent (18.5 km). Adfluvial WCT have spawned upstream of all culverts that were replaced or improved through 1997. Bull trout colonization has also been documented on 6 of 7 streams upstream of the former barriers.

Several components of the Taylor's Outflow project were completed in 1994-98, including reconstruction of »3 km of WCT spawning and rearing habitat and connection (fish passage) to the main stem Flathead River. Projects at Taylor's Outflow, Big Creek, and in the HHR drawdown zone have helped us develop biotechnical approaches for riparian restoration. In 1998, we also completed construction at the Crossover Wetlands site, a pilot project that should increase productivity in the reservoir drawdown zone.

Offsite, lake chemical rehabilitations have been extremely successful in establishing popular fisheries, creating genetic reserves, directing fishing pressure away from recovering stocks, and eliminating sources for new illegal introductions. Lion Lake (treated in 1992) showed a two orders of magnitude increase in fishing pressure after treatment and has the highest pressure per acre of 509 lakes in northwestern Montana. Devine Lake treatment removed the threat posed by introduced brook trout on wilderness BT and WCT populations. Rogers Lake was rehabilitated in 1994 and now serves as a genetic reserve for Red Rocks Lake strain arctic grayling. A spawning run in excess of 1000 grayling used the improved inlet stream in 1996 and 1997. Similar successes are expected on recent rehabilitation projects at Bootjack, Murray, Dollar, and Little McGregor Lakes.

The status of ongoing projects is described in the Methods section (8f). Project plans routinely change as we gain new information and feedback from peers and the public; adaptive management is the rule on most projects. When we use experimental restoration techniques, they are applied on a small scale to evaluate their effectiveness before applications are expanded.

e. Proposal objectives

1. Implement fish passage improvement projects in the Flathead Drainage.

2. Implement habitat restoration projects in the Flathead Drainage.

3. Conduct project-specific monitoring and evaluation of ongoing and completed projects.

4. Complete watershed assessments, site evaluations, and public scoping to identify and prioritize new projects.

5. Monitor watershed level fish and habitat parameters in cooperation with management staff and other BPA projects.

6. Monitor effects of selective withdrawal at Hungry Horse Dam on Flathead River ecosystem.

7. Complete assessment of major biological threats to native fish stocks.

8. Coordinate species recovery planning and operational mitigation activities with other actions in the Columbia River Drainage (i.e, flood control, power, and species recovery actions).

Specific work products for objectives (where applicable) are dicussed in the following section.

f. Methods

Objective 1. Implement fish passage improvement projects in the Flathead Drainage. These projects assume that re-opened habitat will be recolonized by target species and that channels will remain stable, preventing formation of new migration barriers. We plan to complete both tasks by fall 2000.

Task 1a. Remove culvert barrier and road prism on USFS Rd 1638 to allow fish passage in upper Paola Creek. In this cooperative project with the U.S. Forest Service (USFS), ~5 km of low gradient (<2.5%) spawning and rearing habitat in Paola Creek will be re-opened by removing an existing culvert which has a 1.5 m drop at its downstream end. Recent surveys indicate that the stream is fishless above the culvert, despite minimum annual flows of >3 cfs. Westslope cutthroat (WCT) and bull trout (BT) originally inhabited the stream (Weaver et al. 1983) below the culvert and are expected to colonize the new habitat once it is opened. Monitoring will include annual spring (WCT) and fall (BT) redd counts and establishment of a standard 150 m electrofishing section upstream of the culvert. Based on recolonization rates in other passage projects, we expect to see migratory WCT and/or BT above the culvert within 2-3 years after replacement. This project was also listed in the FY99 proposal, but was deferred after a culvert installed downstream was also determined to be a barrier (Task 1b). Concurrent with the work described above, the USFS will reclaim ~ 5 km of Rd 1638, which runs adjacent to the stream.

Task 1b. Install baffles in Hwy 2 culvert to allow fish passage in lower Paola Creek. In the original watershed assessment of Paola Creek (Weaver et al. 1983), BT and WCT were found

from the mouth of Paola Creek to the Rd. 1638 culvert described in Task 1a (~1.5 km). Since that assessment, a 9‘ diameter, 123‘ long culvert was installed at the Hwy 2 crossing and is apparently also preventing fish passage (velocity barrier, >8 fps). In our pre-treatment sampling for Task 1a, we found that the entire stream is now fishless. We plan to install baffles in this culvert to allow fish passage. The basic design for the work was already completed for a culvert of the same size at Stanton Creek (a nearby Middle Fork Flathead River tributary that was previously blocked to fish passage). The baffle design may have to be modified to accommodate differences in discharge and gradient. After Tasks 1a &1b are completed, we expect complete fish passage in Paola Creek and will monitor as described in Task 1a.

Objective 2. Implement habitat restoration projects in the Flathead Drainage. Each project is monitored and evaluated based on pre- and post-treatment data collection (parameters measured vary with purpose). Rationale for each project is included in task description.

Task 2a. Reconstruct selected channel reaches in 1.8 km section of Emery Creek concurrent with road obliteration. Through 1996, Emery Creek supported the largest adfluvial westslope cutthroat trout (WCT) run (mean >155 redds annually) of any direct Hungry Horse Reservoir (HHR) tributary (excluding the South Fork). Concern has arisen over slumping banks, extensive sediment deposition, and unstable channel in the lower 2 km of the stream, which includes lower portions of WCT spawning habitat. Channel degradation appeared minor prior to 1997, when record flows apparently exacerbated the problem. The primary cause of the problem is a bank instability and decreased channel sediment transport capacity related to a road infringing upon the stream’s natural meander pattern. Essentially, the stream is unable to access its floodplain and lateral cutting has resulted. Logging has been limited in the upper drainage and has not led to degradation above this section.

In this cooperative, cost-share project (see section 5), we propose to move the lower 1.8 km of Rd. 1048 several hundred meters away from the stream and correct channel encroachment. The road will be relocated to a bench where an old road prism exists over much of the distance. This will minimize road construction and ground disturbance. The relocated road is needed to maintain public access to the headwaters which are important for hiking, fishing, berry picking, wood cutting, snowmobiling, etc. Preliminary watershed assessment has included habitat (R1/R4), sediment source, and fish surveys, as well as land use history. In 1998, we contracted with a private consultant to develop initial recommendations for restoration. We have reviewed the recommendations and refined them. A major emphasis was determining which sections of the road prism to remove to allow fluvial processes to function naturally. Channel improvements will be implemented by our project in 1999-2000. We will monitor the stream by repeating habitat and fisheries surveys conducted over past years and in the watershed assessment. A critical assumption of this project is that restoring the streams flood plain, stabilizing slumping banks, etc. will lead to a more stable and efficient channel. In addition, we must assume that these changes will benefit aquatic and terrestrial communities.

Task 2b. Plan and complete lake rehabilitation of Skyles and Spencer Lakes or other lakes with illegal, non-native fish introductions. Offsite lake rehabilitations have been an extremely successful and popular component of this program. We have documented >100 unauthorized fish introductions in Flathead Basin lakes. Introduced fish currently limit many formerly productive

and native fisheries. Factors considered in selection of lakes include: impacts of illegal introduction, lake size and location, potential of fishery, public opinion (scoping), management options, presence/absence of rare or threatened species, and probability as a source or recipient for future introductions. Rehabilitations complement and reinforce an extensive education campaign against illegal fish introductions.

In the past, small (<100 acre), closed basin lakes are treated with rotenone (1.5-2 ppm) in fall just prior to ice formation. Chemicals and dead fish degrade naturally under the ice and lakes are restocked the following spring. Pre- and post-treatment monitoring typically includes: fish growth, fish and invertebrate species composition, fishing pressure, and catch rates. In FY2000, we plan to rehabilitate Skyles (39 ac) and Spencer (32 ac) Lakes near Whitefish, Montana. These closed-basin (but connected) lakes were formerly excellent trout fisheries until introduced yellow perch and bluegill became established and stunted. Treatment will eliminate another source for further introductions, provide excellent angling opportunity near a population center, and help relieve pressure on surrounding native (wild) stocks in the inter-connected Flathead System. As with any lake rehabilitation project involving private land, lakeshore owner disputes may arise and delay the project. Therefore, we have pursued other high priority rehabilitation candidates concurrently (e.g., Hidden and Lower Sunday Lakes).

Task 2c. Pursue livestock management agreements and eliminate point sediment/nutrient sources in Dayton Creek drainage in cooperation with CSKT. In 1998, we initiated a cooperative project on Dayton Creek, a 3rd order, direct tributary to Flathead Lake (see 8d for cooperators). The drainage has been heavily impacted by logging and grazing and currently is a major source of nutrient and sediment loading for Flathead Lake (Stanford et al. 1997). Despite extensive irrigation and frequent dewatering of certain tributaries, the stream supports a weak population of WCT and infrequent BT. The upper third of the drainage, primarily owned by a Plum Creek Timber Company, is heavily logged and grazed. Riparian condition generally improves downstream as logging and grazing impacts decrease. Our initial watershed assessment included basin-wide riparian and channel inventories, fish distribution and species composition, continuous temperature and flow measurements, and GIS mapping. Meetings with individuals and groups of landowners were held, with a consensus supporting the project. Results of this comprehensive assessment were printed in an annual report (Ducharme et al. 1998), which will serve as the basis for prioritizing upcoming restoration activities. In addition, Bureau of Reclamation has provided a water conservation specialist at our request to assess the drainage and recommend water use alternatives (expected completion, 5/99).

In 1998, we also initiated on-the-ground actions in the Dayton Creek drainage. In cooperation with the Hungry Horse Wildlife Mitigation Program, we developed a landowner agreement that excluded livestock from 320 acres of stream corridor and associated uplands in a heavily grazed reach on the Middle Fork of Dayton Creek. The landowner donated much of the fencing material and labor for the project. This project set a good precedent in the drainage and will should encourage other landowners to participate as we develop a systematic plan for recovery.

In 1999-2000, we will pursue additional riparian projects, beginning with the upper drainage. In the past, Plum Creek Timber Co. has been open to various alternatives including grazing allotment changes and fencing. Landowners have also expressed interest in alternatives as long

as water rights are not violated. We are also working with local road departments and landowners to alleviate sediment sources at road crossings and nutrient sources from stock use. Our goal to eliminate point sources and address water availability concerns initially, then move on to address larger scale habitat and land use issues that exist in the drainage. Future monitoring parameters will include nutrient loading, riparian condition, bank stability, fish distribution and abundance, and instream flows. This is a long term watershed restoration project.

Task 2d. Place large woody debris (LWD) in deficient (clear cut) upper reaches of Big Creek and Coal Creek drainages where wood recruitment is limited. Tributaries to the North and South Fork were identified as core areas for WCT and BT in the Flathead Drainage (Knotek et al. 1997). Past timber management has allowed clear-cutting right to the stream margin in certain upper portions of these watersheds, including perennial and intermittent reaches. Ground surveys have documented that large LWD in these streams is the major source of complexity, pool formation, and sediment storage. In addition, we have found that LWD recruited to streams prior to intensive logging has naturally degraded and is losing functionality. There is a tremendous amount of bedload stored behind these woody debris complexes which, once released through natural breakdown, will release this material and cause pool filling downstream.

In this project, we propose to add LWD to specific stream reaches where wood recruitment is not likely for decades. Specifically, we will concentrate on upper tributaries of Big and Coal Creeks. Using unimpacted reaches as reference areas, we will concentrate wood placement in headwater areas where wood recruitment from above is limited, particularly those areas where pool formation will benefit resident fish. Trees will be selected from offstream areas and placed randomly using a helicopter or all-terrain excavator. Trees will not be anchored and are intended to form natural debris jams. The USFS has implemented this technique on certain sections of the Big Creek drainage in 1996 and 1997 with desired results. We began co-sponsoring similar projects in 1998. The wood trapped materials in the first year and migration of the wood has been tracked using GPS. We will use continue this technique for monitoring.

Task 2e. Construct channel and pond complex for Sekokini Springs Experimental Rearing Facility. In 1998, MFWP and BPA purchased the Sekokini Springs Trout Farm located on the Middle Fork of the Flathead River. This private hatchery had been in operation for decades, producing rainbow trout for fish ponds, commercial sale, etc. The site was purchased for two reasons: (1) To eliminate a primary source of rainbow trout leaking directly into the Flathead River (competition and hybridization risk for WCT) and (2) it offers a unique combination of natural habitat and small, isolated spring-fed rearing ponds that could easily be customized for native species recovery work. The ultimate vision for this project is a state-of-the-art rearing facility where drainage-specific WCT stocks will be propagated for restoration stocking under natural conditions and at low densities (Marotz 1998). The site will also eventually be used for imprinting experiments to help develop methods of re-establishing wild, self-sustaining stocks.

This task represents one step in a progression of actions needed to make the facility functional. Operation of the facility will be reviewed under the Artificial Production Review 3-Step Process. Modification/construction of a series of ‘natural’ ponds and rearing channels is a major component of the project. We will use specifications for ‘e’ and ‘a’ type channels (Rosgen 1996) and earthen ponds (SCS 1982) to create isolated habitats tied to a series of springs at the site.

The conceptual design includes a series of inter-connected (but passage isolated) natural habitat reaches where individual WCT stocks can be propagated. We will employ technical (engineering) assistance from the Bureau of Reclamation and from MFWP fish culture specialists to aid in the physical specifications. Full operation of the site is not expected for several years.

Task 2f. Complete riparian fencing in lower Hay Creek to exclude cattle in conjunction with (USFS) grazing allotment modification. Hay Creek is a North Fork Flathead River tributary that supports a native fish community. Passage for adfluvial BT was restored through a project we completed in 1996. Lower sections of the stream are being degraded by overgrazing. Although grazed sections are downstream of the best trout spawning habitat, the section is an important rearing area and migration corridor. This reach is also adjacent to Glacier National park, part of a Wild and Scenic Rivers corridor, and is frequented by grizzly bear, gray wolf, and other sensitive species. The USFS has agreed to modify or eliminate their portion of the grazing allotment. This change will involve jack-leg fencing to ensure that livestock are excluded from riparian areas and wetlands. We are planning to cost-share this project with the USFS and Hungry Horse Dam Wildlife Mitigation Program.

Objective 3. Conduct project-specific monitoring and evaluation of ongoing and completed projects. Monitoring addresses factors targeted or expected to change as a direct result of the project. Monitoring is conducted annually before and 3-5 years after project implementation. Duration and frequency will vary by project thereafter. Many examples of ongoing monitoring activities are presented in Knotek et al. (1997).

A basic tool used in all projects is a precise pre- and post-treatment photo point series. Although subjective, this is the most efficient method for monitoring recovery of riparian vegetation. In fish passage projects, fish community composition and relative abundance are assessed in established 150 m electrofishing sections above the former barrier. We also use weir traps or conduct redd counts in consistent sections to measure runs of adult, migratory stocks before and after treatment. Habitat changes are measured using a series of cross-sectional and longitudinal profiles at consistent stations with level I and II methods of Rosgen (1996). Bank stability is measured using an index developed by the USFS. Flow and temperature measurements are completed using standard techniques and contemporary equipment. In rehabilitated lakes, we use standard gill-netting, invertebrate sampling, and creel procedures. Monitoring data are analyzed using trend (correlation) analyses, t-tests, etc. where appropriate. This section has been abbreviated due to space limitations and redundancy with next section.

Objective 4. Complete watershed assessments, site evaluations, and public scoping to identify and prioritize new projects. Tasks below represent known projects opportunities that will be evaluated. In addition to these, we are constantly reviewing and prioritizing potential projects using the system described in Knotek et al. (1997).

Task 4a. Complete site evaluation, feasibility analysis, and landowner/public scoping for Rose Creek project. Rose Creek is a large capped, spring that originates on a 20 acre section of MFWP land just North of Flathead Lake. We plan to evaluate the feasibility of several mitigation options using this water source such as creation of a westslope cutthroat rearing stream, expanding a wetland complex that feeds into the lower Flathead River, etc. The project would

require several landowner agreements and careful planning before it could be implemented. If the project appears feasible, initial steps will include detailed mapping, landowner agreements, etc.

Task 4b. Complete watershed assessments for upper tributaries of Big and Coal Creeks to identify riparian areas that have experienced extensive clear cutting. Watershed assessments are almost complete for North and South Fork tributaries where LWD additions are planned (Task 2d). Any deficient fish survey, instream habitat, or riparian condition data will be completed. We have used logging sale records, aerial photos, and low-level flights to identify major problem areas. We will ground truth and pinpoint areas where LWD recruitment is limited, reference unimpacted reaches, and plan locations (and quantities) for LWD.
Task 4c. Evaluate and scope future candidates for lake rehabilitation. This is a continuous process that stresses public involvement and cost-effectiveness. Public scoping is critical to get feedback and make sure the public is informed about rationale for the project and properties of rotenone. Extensive public involvement also helps assure that illegal fish will not be reintroduced. Specific considerations used in selecting lakes are described in Task 2b methods.

Objective 5. Monitor watershed level fish and habitat parameters in cooperation with MFWP Fisheries Management staff , other BPA projects, and, to a lesser extent, other agencies. Although tasks seem extensive relative to on-the-ground projects, cooperation and logistic coordination among different staff allows us to compile these valuable data as habitat project schedules allow. Many of these activities represent long-term (reference) data sets on the strongest remaining populations of bull trout (BT) and westslope cutthroat trout (WCT).

Task 5a. Substrate coring and scoring in index spawning and rearing tributaries. Measurements of the size range of materials in the streambed are indicative of salmonid spawning and the quality of incubation habitat. Research in the Flathead basin has shown negative relationships between fine sediment (<6.35 mm) levels and emergence success of WCT and BT (Weaver and Fraley 1991; 1993). Field crews use a standard 15.2 cm hollow core sampler (McNeil and Ahnell 1964) and separation procedures (Shepard and Graham 1982) to collect and analyze substrate samples in known spawning habitat. Annual streambed coring sites (21) in tributaries of the North Fork, Middle Fork, South Fork, HHR, Stillwater River, and Whitefish River have been sampled for more than a decade to monitor fine sediment levels.

Task 5b. WCT and BT redd counts in index spawning streams. Spawning redds are excavated in tributaries by adults that have presumably returned to their natal stream to spawn. Redd counts serve as an index of migratory adult abundance. Timing, location, and size of reads are used to distinguish among species and in discriminating resident and migratory fish. We have established BT and WCT monitoring sections in tributaries of the North Fork (4 BT sections, 2 WCT sections), Middle Fork (4 BT, 2 WCT), HHR (4 BT, 10 WCT), and South Fork upstream of HHR (5 BT). Annual red counts have been completed for 4-18 yrs in these sections using consistent methods, often by the same MFWP personnel. Based on basin-wide BT counts (completed ~5 yr intervals), index sections contain > 50 % of the total redds in each drainage.

Task 5c. Recruitment estimates. Juvenile BT and WCT monitoring reaches have also been established to measure annual recruitment in tributary spawning and rearing streams. Population estimates are completed in 150 m sections by electrofishing and using a multi-pass removal

method (Zippen 1956). Monitoring reaches are located in the following drainages: North Fork (6 BT sections, 2 WCT sections), Middle Fork (2 BT, 1 WCT), South Fork tributaries of HHR (1 BT, 11 WCT), Stillwater River(1 BT, 1 WCT), and upper Whitefish River (2 BT, 1 WCT).

Task 5d. River population estimates. Fish abundance and size structure are assessed in larger river reaches using mark-recapture (visual snorkel) estimates. These estimates are rotated annually in consistent sections of the North Fork (3 km), Middle Fork (3 km, 3 km), and South Fork (2.4 km, 4.4 km). We also use boat electrofishing catch-per-unit-effort estimates to monitor community structure and relative population abundance in two reaches (2 km, 3 km) of the main stem Flathead River. Samples taken in these surveys are also used in age and growth analyses to monitor effects of selective withdrawal at Hungry Horse Dam.

Task 5e. Lake and reservoir gill-netting. Fish communities in Hungry Horse Reservoir and Flathead Lake are monitored using annual gill net series. Experimental floating and sinking gill nets are set at locations throughout the lake and reservoir in spring (4/25-5/15) and fall (10/25-11/10), respectively, to assess relative fish abundance and species composition. Nets fish designated areas and depths to provide comparable trend data between years. At sampling sites, we set both sinking and floating experimental gill nets (overnight) perpendicular to shore. Gill nets are 38 m long and 2 m deep, consisting of panels with 19, 25, 32, 38, and 51 mm mesh sizes. The following data are collected from captured fish: abundance, total lengths and weights, stomach contents (food habits), and scales for age and growth information. Specific methods are described by Deleray (1997).

Objective 6. Monitor effects of selective withdrawal at Hungry Horse Dam on Flathead River ecosystem. In fall 1995, selective withdrawal became operational at Hungry Horse Dam and returned normative thermal conditions to the lower South Fork and main stem Flathead River. Monitoring design is based on comparison of pre- and post-implementation conditions. Monitoring is intended to refine the system to benefit aquatic communities downstream.

Task 6a. Thermal monitoring of Flathead River system. Prior to selective withdrawal, hypolimnetic releases from the reservoir suppressed downstream river temperatures. We have installed 6 continuously recording thermographs including 2 controls (natural temps above South Fork and in Stillwater River) and 4 stations longitudinally along the South fork and main stem Flathead River to track and compare river temperatures. These data are used to fine-tune operation of the system. After FY2000, we will likely cut back our thermal monitoring.

Task 6b. Quantify effects of selective withdrawal on river macrozoobenthos. Return of normative river temperatures should increase diversity and abundance of certain groups of macroinvertebrates. Prior to selective withdrawal, Hauer et al. (1994) designed and completed a study of macrozoobenthos in the Flathead River system. The study quantified seston drift and macroinvertebrate density and diversity at five stations throughout the year (monthly). In an ongoing study, we are repeating these methods to directly compare pre- and post-treatment data. Collection of samples will likely be completed by FY2000, but laboratory analysis will continue during this fiscal year.

Task 6c. Quantify effects of selective withdrawal on fish growth. We assume warmer river

temperatures will increase (or alter) the availability of macroinvertebrate forage for fish. Prior to operation of selective withdrawal, we collected scale samples (in winter) from rainbow trout and mountain whitefish from several sites in the lower Flathead River. These species were chosen because of their fluvial life histories. Annual growth increments will be back-calculated for specific age classes (ages 2-4). At these ages, fish should be immature and living in the main river. In 1999-2000, we will repeat electrofishing procedures to collect our post-treatment sample. The model of Weisberg and Frie (1987) allows direct comparison of growth after effects of good and bad growth years are removed using simple F and t tests.

Objective 7. Complete assessment of major biological threats to native fish stocks.
Task 7a. Oversee graduate project in cooperation with the University of Montana examining interactions between rainbow trout (RBT) and westslope cutthroat trout (WCT) in the Flathead River. Hybridization and competition (with RBT) are considered a major threats for WCT stocks. In 1999-2001, we plan to sponsor a graduate student will evaluate interactions of these species in the upper Flathead Drainage. Westslope cutthroat are essentially found everywhere in the drainage. The primary questions are: a) What is the current and potential distribution of rainbow trout?, b) When and where do rainbow trout spawn?, c) What is the introgression rate for RBTxWCT in specific tributaries where the species overlap?, d) Which streams/stocks are at greatest risk?, and e) How are RBT responding to mitigation habitat/passage projects? Since the distribution of RBT is still limited in the drainage and we have substantial anecdotal information, addressing some or all of these questions is a realistic objective for a Master's student. Specific hypotheses and research tasks (related questions framed above) will be developed by the student, major professor (Dr. Chris Frissell), and the principal investigator of this project. Results will help determine future management actions, regulation changes, and native species restoration strategies. This task will be cost-shared with project 9401002 (Flathead River Native Species Project), since telemetry work will likely be a large component of the study. Activities involving telemetry and river sampling will be closely tied with project 9401002 since they have a monitoring system (ground stations, regular flights, etc.) and field techniques already established.

There is a broad range of literature related to interactions of these species and the associated influence of abiotic variables (e.g., Swift 1976; Frissell 1992; Berman 1998). However, much of the available information is related to laboratory and hatchery experiments or anadromous stocks and does not address the site-specific questions we are facing. Baseline information consists of data from past monitoring and watershed assessments (Read et al. 1982; Weaver et al. 1983), and reports from anglers in the drainage.

Task 7b. Collect samples for whirling disease and genetics testing in selected Flathead River tributaries. Sampling is not conducted for these purposes alone, but we routinely collect samples in conjunction with watershed assessments and monitoring activities. Whirling disease was recently detected in the Flathead Drainage (Swan River) and poses a serious threat. Genetic testing concentrates on 'purity' of WCT and BT populations and introgression rates with rainbow trout and brook trout (related to task 7a).

Objective 8. Coordinate species recovery planning and operational mitigation activities with other actions in the Columbia River Drainage (i.e, flood control, power, and species recovery actions). Personnel in the mitigation program have extensive experience with fish species listed under ESA

(BT and WCT-petitioned) and Columbia River system modeling. This expertise frequently warrants staff involvement in advisory and editorial roles.

Task 8a. Montana is currently assessing and planning recovery actions for BT and WCT through Westslope Cutthroat and Bull Trout Recovery Teams and Scientific Groups. Our region contains the strongest remaining populations of these species, so we are actively involved in protection and recovery measures. Our staff includes experts on these species in Montana.

Task 8b. Refine and update IRCs and reservoir/river models. For FY2000, CBFWA and BPA recommended that the Hungry Horse component of the Modeling Technical Analysis Project (8346500) be combined with this project. A private contractor (modeler) is employed to fill this role. Primary activities include: evaluation of impacts of drawdowns at Hungry Horse Reservoir on WCT and BT through their ontogeny, refinement of IRCs, maintenance of model code, modification of program utilities, construction of optimization programs to link IFIM river models with existing reservoir models, and execution of model runs using the Montana reservoir model HRMOD. Results are used to recommend operational strategies to improve conditions for biological production, particularly in Hungry Horse Reservoir.

g. Facilities and equipment

See Umbrella Proposal for Hungry Horse Fisheries Mitigation (MFWP).

h. Budget

Overall costs for the scope of this project are kept low because of efficiency, reasonable indirect costs, low salaries, and cost-shares.

A large proportion of the total budget covers salaries and benefits of project personnel. This is a cost-effective use of BPA funds for several resons: 1) Despite ranking near the top in education and training credentials, MFWP personnel rank near the bottom in salary among fisheries professionals - the average experience of employees on this project is ~11 yrs, 2) We design and implement nearly all projects and activities, where other agencies contract with costly private consultants, and 3) We are very efficient in completing the broad range of tasks listed with only 7.76 FTE.

We feel that costs for supplies, operations, maintainence, and construction are appropriate for the objectives and tasks listed. High travel costs mostly reflect the long distance from Kalispell to Columbia Basin-related meetings and activities (usually held in WA or OR). As mentioned previously, $10,000 was added to the budget for FY2000 because the Hungry Horse Modeling Technical Analysis Project (8346500) was assimilated into this project.

We believe this project is one of the strongest (and legitimate) candidates for multi-year funding for many reasons:

1) The project has been scrutinized under a series of peer reviews by Anderson, Swartzman,

ACOE, BPA, ISG, ISAB, etc.

2) The project has approved long-term planning documents including the Hungry Horse Dam Fisheries Mitigation Plan (MFWP & CSKT 1991), the Hungry Horse Dam Fisheries Mitigation Implementation Plan (MFWP &CSKT 1993) and an updated fish passage and habitat improvement plan (Knotek et al. 1997).

3) The project has NPPC-approved loss statements for fish and habitat and addresses numerous specific NPPC program measures.

4) The project focuses on protection and enhancement of native westslope cutthroat and bull trout stocks in one of the best remaining strongholds for these species.

5) The project incorporates benchmarks and a comprehensive monitoring program that allow us to track the progress of implemented projects, evaluate their effects on aquatic habitats and fish populations, and demonstate long term cost-effectiveness.

6) The project has a proven track record of successful, scientifically-based projects on the ground.

Few, if any, other BPA-funded projects in the basin possess these qualifications.

Section 9. Key personnel

BRIAN MAROTZ
Fisheries Program Officer - Oversees all BPA projects in Montana
See Umbrella Proposal for Hungry Horse Fisheries Mitigation (MFWP) for resume

W. LADD KNOTEK
Implementation Biologist and Principal Investigator, FTE=1.0
Montana Fish, Wildlife and Parks
490 N. Meridian Road, Kalispell, MT 59901
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DUTIES: Manages daily operations of the project including project prioritization, project design and implementation, public scoping, permitting, supervision of technicians, and scheduling.

EDUCATION:

M.S. in Fisheries Biology - 1995
Virginia Polytechnic Institute and State University
Honors: EPRI Fellowship, AIFRB Research Assistance Award, AFS Skinner Memorial Award, GPA: 4.0

B.S. in Biology - Fisheries/Wildlife Emphasis, Chemistry minor - 1992

University of North Dakota
Honors: Arthur Anderson Award/Scholarship, Robertson Achievement Award, Behringer Award/Scholarship, Paur Award/Scholarship, The Wildlife Society Scholarship, Phi Beta Kappa, GPA:4.0, Graduated Summa Cum Laude

ADDITIONAL TRAINING:

* Fish Otolith Preparation and Microstructural Examination, Virginia Dept. Of Game and Inland Fisheries, Instructor: Mike Duval. Lynchburg, VA, November, 1995.
* Applied Fluvial Geomorphology, Wildland Hydrology Consultants, Instructor: Dave Rosgen. Pagosa Springs, CO, June, 1996.
* River Morphology and Applications, Wildland Hydrology Consultants, Instructor: Dave Rosgen. Pagosa Springs, CO, July, 1997

RECENT RELEVANT EXPERIENCE:

* Department of Fisheries and Wildlife Sciences, Virginia Tech
  Research assistant for striped bass recruitment study at Smith Mountain Lake Virginia.
* Department of Fisheries and Wildlife Sciences, Virginia Tech
  Research assistant for field and laboratory studies involving stream fish recruitment and reproductive ecology.
* Biology Department, University of North Dakota
  Research assistant/lab technician for several studies encompassing fish and invertebrate ecology in streams and lakes

EXPERTISE: Design and implementation of fish passage and habitat restoration projects. Extensive experience with sampling design and monitoring approaches.

RECENT PUBLICATIONS AND REPORTS:

Knotek and Orth (1998), Knotek et al. (1997), Cavigli et al. (1998)

TOM WEAVER
Fisheries Monitoring and Research Specialist, FTE: 0.6
Montana Fish, Wildlife and Parks
490 N. Meridian Road, Kalispell, MT 59901
phone: (406) 751-4542

DUTIES: Designs and coordinates watershed level monitoring activities. Represents project on Montana Bull Trout Scientific Group and Westslope Cutthroat Restoration Team

EDUCATION:

B.S. in Wildlife Biology (Aquatic) - 1980

University of Montana

EXPERIENCE:

Employed by Montana Fish, Wildlife and Parks (MFWP) since 1977. Through various technician and researcher positions, helped develop basin-wide fisheries monitoring program for the Flathead Drainage.

In 1984-86, was employed by Montana Cooperative Fisheries Research Unit, Montana State University. Conducted independent research on the effects of fine sediment on embryo survival to emergence for westslope cutthroat and bull trout.

Past and Ongoing activities include:

* Senior bull trout researcher for MFWP.
* Member of Montana Bull Trout Scientific Group
* Advisor for Montana Bull Trout Recovery Team
* Member of logging Best Management Practices (BMPs) audit team since 1987
* Cooperative researcher and/or contracts with Flathead National Forest, Glacier National Park, Flathead Basin Commission, and Montana Department of Natural Resources and Conservation
* Regularly consults with USFWS during bull trout ESA listing process.

EXPERTISE: Ecology and status of native salmonids in the Flathead Basin, the effects of forest management activities on native salmonids, and development and implementation of fisheries monitoring activities in the Flathead Basin.

PUBLICATIONS AND REPORTS:

Weaver et al. (In prep.), Weaver and Fraley (1993), Weaver and Fraley (1991), Weaver et al. (1983)

Section 10. Information/technology transfer

See Umbrella Proposal for Hungry Horse Fisheries Mitigation.

Congratulations!